

Aboriginal Use of Fire in Southeastern Australia

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When European settlement began in southeastern Australia, Aboriginal people were observed using fire as a land management tool. Fire was used to clear the underbrush and make travel easier, to hunt large and small game, and to increase the abundance of certain types of plant foods. As a consequence of regular and systematic burning, vegetation mosaics were created which maximised and maintained species diversity. Many of the vegetation associations observed by Europeans in 1788 were artefacts of human intervention. When traditional burning stopped, those areas which had been created by Aboriginal firing changed in species composition. A lower frequency fire regime resulted in more woody understorey plants dominating. A consequence was that when a fire did occur, the fuel load was greater and the fire more intense. The suggestion that Aboriginal fire regimes should be re-introduced to minimise the impact of bushfires ignores the spatial variability inherent in traditional Aboriginal burning regimes, and also ignores the fact that the aims and consequences of hazard reduction burning are very different from the aims and consequences of Aboriginal burning practices.

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INTRODUCTION

In January 1994, following the devastating bushfires which swept through southeastern Australia, an article was published in one of the Sydney newspapers under the heading 'Liberals to seek aid of tribal elders in fire policy'. The article went on to explain that 'Land management techniques used by Aborigines for thousands of years including regular burning may be incorporated to the policy in an effort to prevent a repeat of the disaster' (Crouch 1994).

In other parts of Australia, Aboriginal knowledge is being put to good use in the co-operative management of National Parks (Birckhead et al. 1993), so at first glance there may also appear to be some merit in this approach for the more populated parts of Australia. However, a more detailed investigation would strongly suggest that seeking the advice of 'tribal elders' or indeed other Aboriginal people on fire policy in southeastern Australia in the 1990s is at best not relevant, and probably totally inappropriate.

Aboriginal people in various parts of Australia have used, and in some cases still do use, fire as a land management tool. However, the relationship between traditional Aboriginal burning and current attempts to maintain biodiversity and reduce property loss due to wild fire in the 1990s is tenuous. While many Aboriginal people have a detailed understanding of the characteristics and control of fire, the motivation for using fire and indeed the consequences of its use are determined by an Aboriginal cultural perspective.

USES OF FIRE BY ABORIGINAL PEOPLE

When Europeans first arrived in Australia, there were between one and two million Aboriginal people speaking over 600 distinct languages and utilising every single eco-

logical zone right across the continent (Butlin 1983; 1993). They had developed technologies and social systems which allowed them to exist and indeed flourish in arid areas where Europeans have found it difficult to survive, even with the advantages of modern technology. Aboriginal people adapted to the environment in which they found themselves, and over time they changed their technology and land management practices in response to changes in the environment. They used the land effectively and efficiently, maximising the productivity in a sustainable way.

Archaeological evidence suggests that Aboriginal people arrived on the Australian continent at least 40,000 years ago, probably 50,000 years ago, and possibly 60,000 years ago (Roberts et al. 1991). When they came, they brought with them knowledge of fire. Just how important fire was to them during the early period of occupation of Australia is largely a matter of conjecture. Certainly, the presence of humans using fire to cook and keep warm would lead to a higher frequency of bush fires, but there is no direct evidence to suggest that fire was used extensively as a land management tool at that early period. From an evolutionary perspective, fire was an important component of the Australian environment long before Aboriginal people arrived. Because fire has been a component of the Australian biota for a considerable period of time, much of the Australian vegetation is therefore fire-adapted, or at least fire-resistant. Many Australian animals have also been shown to be adapted to regular fires (Catling 1991).

One claim for early and systematic Aboriginal use of fire is that of Gurdip Singh, from the Australian National University in Canberra (Singh et al. 1981). Singh studied pollen and charcoal in sediments from Lake George, a large freshwater lake just north of Canberra, and he found significant changes in the vegetation pattern and charcoal content of his cores at around 120,000 years ago. The fire-resistant species, like the eucalypts, began to dominate at this time. Singh suggested that these changes were the result of Aboriginal people first arriving in Australia and bringing with them techniques of firing the landscape (Singh and Geissler 1985).

Although there has been no direct confirmation of Singh's work, similar patterns of vegetation change have been detected in deep sea cores from off the Queensland coast at broadly the same time (Kershaw et al. 1993), and at a later date, around 38,000 years ago, in pollen cores from the Atherton Tablelands in north Queensland (Kershaw 1986, 1993). Here we have the first suggestions that Aboriginal people may have had an active role in creating and changing the environment in which they lived by their use of fire.

However, the period around 120,000 years ago was relatively warm, just the kind of environmental conditions which might be expected to support forests including fire-resistant vegetation such as eucalypts. Since there is no archaeological data to support such an early human occupation of Australia, it seems likely that climate change was responsible for the vegetation changes.

During the periods of extreme low sea level around 18,000 years ago, the average temperature fell by somewhere between 4 and 7 degrees Celsius, while the rainfall may have decreased by as much as 50% (Dodson 1991). The implications of such changes are clear. The lush forests were reduced, and many areas in the south of the continent became grasslands and open woodlands. Such large scale changes in vegetation were primarily responses to climatic change, and cannot be attributed to Aboriginal burning.

During the coldest periods, parts of Tasmania became glaciated. The Tasmanian data presents us with an interesting set of problems. Some Aboriginal burning seems to have occurred in the southwest during the terminal Pleistocene, perhaps between 18,000 and 12,000 years ago. With the greater rainfall of the Holocene, rainforests developed, probably because the wetter conditions. Fire was acting in opposition to the direction of climatic change — burning favours sclerophyll vegetation, while the moister climate favoured rainforest plants (Pyne 1991). Climate won. The same may be said of Lynch's Crater in North Queensland, where rainforests returned within the last five to six thousand years (Kershaw 1986). Perhaps what we are observing in the last few thousand

years is the struggle between anthropogenic fires and climate, with climate seeming to come out in front in most situations.

So did Aboriginal people have any significant impact on the Australian environment? Did they effect the distribution of plants and animals across the landscape, particularly though their use of fire? David Horton (1982: 237) has argued that: 'Aboriginal use of fire had little impact on the environment and ... the patterns of distribution of plants and animals which obtained 200 years ago would have been essentially the same whether or not Aborigines had previously been living here'.

Horton takes the extreme position — little or no human impact. He believes that it was climatic change which was the driving force behind the development of contemporary Australian vegetation patterns. Consequently, since the Holocene period has been relatively stable, he must also argue that these changes were virtually completed by 10,000 years ago. Yet there is evidence for some important changes in some vegetation associations during the Holocene.

At the other end of the spectrum, Singh and Kershaw have both argued that fire-induced changes in the Australian vegetation began around 120,000 years ago with the arrival of the Aborigines. Horton argues that fire has always been a component of Australian ecosystems and Aborigines had no impact — Singh and Kershaw argue that fire only became important with the advent of the Aborigines. The truth probably lies somewhere between these two extreme views.

Fire as a land management tool

Before we can adopt traditional Aboriginal burning as a land management tool, there are a number of important questions which need to be answered about Aboriginal burning practices. How long have Aborigines been burning intensively, and what does this burning do to the vegetation, and as a consequence, to the fauna? Many of these basic questions have yet to be satisfactorily answered.

Robyn Clark (1983) believes that on the basis of the palynological evidence: 'Aborigines neither created nor maintained vast areas of grassland, although their burning may have been responsible for the continuation of patches of grassland or woodland within larger forested regions. Climate has been and is far more important than fire in determining the distribution of Australian vegetation, but Aboriginal burning might have effected the rate of vegetation change'.

One complicating factor is that Aboriginal burning methods may not have always been the same. The use of the ethnographic analogy — making the assumption that what we see in the ethnographic present is the same as what existed in the prehistoric past — is fraught with danger. The same cautious approach which is used by prehistorians in assessing artifact functions or cultural practices must be used when investigating Aboriginal burning practices.

On balance, the archaeological, palynological and geomorphological evidence suggests that regular intensive Aboriginal burning is a relatively recent event. Beaton (1982) has studied the Aboriginal use of cycads, a group of plants which contain highly toxic compounds. He documents increases in the number of edible cones after firing, and suggests that one of the uses of fire was to increase the yield of these plants. On the basis of his archaeological studies, he also believes that they were first exploited around 4,000 years ago when the technological processing to remove the poisonous components became known to Aboriginal people. This period of around 4,000 years ago is a time when major technological changes are evident in the archaeological record throughout southeastern Australia. The term 'Intensification' is used to describe the range of changes in site usage, settlement pattern and social interaction which characterised Aboriginal culture in the late Holocene (see Lourandos and Ross 1994). This may well be when intensive use of fire to increase the availability of specific resources was initiated.

There are other forms of evidence which support the view that intensive Aboriginal burning is a relatively late phenomenon in terms of human occupation of Australia. Hughes (1981) and Hughes and Sullivan (1981) have argued that the increase in valley fills in eastern Australia during the last 3,000 years was caused by increased Aboriginal burning. Fires removed the ground cover and understorey, and allowed the sandstone slopes to erode more rapidly, filling up the valley floors with deposit. Hickin and Page (1971) reported that valley fills from the Wollombi valley had been dated to the last 4,000 years. Clearly these recent dates for valley fills in the Sydney region indicate some kind of geomorphic process initiated by something other than climate. Hughes and Sullivan point the finger at Aboriginal burning, and it is difficult to find any other satisfactory explanation. So while regular low-intensity burning as practiced by Aboriginal people in some areas may indeed reduce the severity of wildfires, it may also increase the rates of soil erosion, at least on sensitive geological substrates like Hawkesbury Sandstone.

Spatial and temporal variability in Aboriginal burning patterns

In any understanding of traditional Aboriginal burning practices, it is necessary to look at both the spatial and temporal variability — which parts of the landscape were burned, and when were they burned. Gamble (1986) concludes that much of Arnhem Land is an 'artificial wilderness'. Gould (1971) demonstrated that fire was an important aspect of traditional culture in the Western Desert. Clark and McLoughlin (1986) believe that sandstone and shale substrates were burned at different frequencies in the Sydney region. Head (1989) points out that in recent times, contemporary Aboriginal groups have been maintaining both fire-dependent and fire-resistant communities. Indeed, what Aboriginal people were trying to achieve was a balance between the need to burn some areas to promote certain resources, and the need to protect other areas from fire where particular plant foods grew, particularly rainforests and wet sclerophyll forests. Aboriginal burning often produced a mosaic of vegetation associations, maximising the diversity and therefore the productivity of an area (Kohen and Downing 1992). Rather than suggesting that Aborigines burned the landscape, perhaps it is better to say that they managed the landscape, and that fire was one of the tools which they used. Indeed, some burning was clearly used to prevent wild fires destroying some fire-sensitive areas.

Rhys Jones was the one of the first to suggest that this burning was controlled or directed (Jones 1969). He saw fire as an important tool in increasing the productivity of the land, by replacing mature forests with open woodlands and grasslands. It seems likely that Aborigines contributed little to this process until the late Holocene, when their increased population and more intensive use of fire promoted certain species to the disadvantage of others, but generally on a local scale. Before this time, the direction and extent of vegetation change was largely directed by climate.

The increase in Aboriginal burning was probably a consequence of the introduction or invention of new technologies which allowed Aboriginal people to focus on those large resources which were previously so difficult to capture — kangaroos, large wallabies and emus. The advent of spearthrowers and multi-barbed spears probably facilitated greater exploitation of these resources. Fire was initially used to promote and retain the environments which were most suitable for these large animals, and fire was subsequently used for maximising the productivity of these areas after the Aboriginal population increase which occurred largely because of the greater access to these abundant resources (Kohen 1995).

Vegetation associations generated or maintained by Aboriginal burning

In the ethnographic present Aboriginal people use fire as a multipurpose tool. It is used to open up the vegetation to make travel easier (in their words to 'clean up the

country'); it is used to hunt large game like kangaroos directly; it is used to hunt possums in hollow trees; it is used to promote the growth grass to attract large herbivores; and it is used to promote some types of plants, particularly cycads and tuber-bearing orchids and lilies which grow in open woodlands. One of the consequences of regular burning is that it may increase nesting sites for arboreal animals by increasing the numbers of hollows in trees. Certainly fire is used to drive snakes away from the camp sites, and to maintain contact between groups.

In order to understand what traditional burning patterns may have been like in southeastern Australia, it is useful to see how and why contemporary Aboriginal communities burn in other parts of the continent. While the marked seasonality of the tropical north strongly influences the way in which Aboriginal people use fire, their reasons for burning and the mechanisms for controlling fire are similar to those documented ethnographically for the southeast. Stephen Pyne (1991: 122) recorded the burning patterns of the Gunei tribe in Arnhem Land, and presents a picture of highly controlled burning patterns, tied to the season. He suggests that: 'Burning actually starts at special sites while the rainy season is still in progress. It escalates as drying spreads, ... and it culminates at the end of the Dry with a conflagration of those places destined for burning but not yet fired'.

However, not all of the area was burned with the same frequency: 'The fires were sequential, and burning a composite of practices in a mosaic of environments that extended over nine to ten months. Most of the grasslands and savannas burned; portions of the floodplains burned twice; the woodlands and the forests on the order of a fourth to a half their area (ibid: 123).

Local environmental variables are clearly taken into account, with different environments being burned at different frequencies. Some areas were not burned at all.

The other factor which is fundamentally important is the familiarity with the landscape and the knowledge of how to control fires on a local level. Again, Pyne suggests: 'They exercise control by timing the fires with diurnal wind shifts, by relying on the evening humidity, and by exploiting topographic features like cliffs and streams and old burns' (ibid).

So the burning practices in Arnhem Land are based on an intimate knowledge of local conditions. Such a burning regime is only possible when the people lighting and controlling the fires are familiar with the local topography and the means of controlling the intensity, direction and duration of the fire, that is, when they are burning their own land and for their own purposes.

Historical records of burning in southeastern Australia

If we use the Sydney region as an example of southeastern Australia, there are many ethnographic descriptions of Aboriginal land use and settlement pattern detailed in the early historical records. Aborigines were concentrated on the coast in the summer at relatively large and semi-permanent camps. Both Cook and Phillip reported seeing coastal 'villages' of up to a dozen huts housing 50-60 people. This number of people corresponds to a clan (the land owning group) or a band (the land using group), the social entities referred to as 'tribes' by the early settlers. Yet we know that in the Sydney area many of these 'tribes' did not come to the coast at all. The people who lived west of Parramatta were referred to as the woods tribes, and they even spoke a different dialect of the local Darug language (Kohen 1988). It is clear that large numbers of people, at least several thousand, could be supported at a high population density in the Sydney region.

One important aspect of Aboriginal economy was the practice of regularly burning the underbrush. Aborigines were still burning large tracts of land at Castlereagh as late as the 1820s (Kohen 1986). Phillip (1791) observed 'the natives so frequently setting fire to the country, which they do to catch the opossum, flying squirrel, and other animals ...'.

When expeditions began exploring the countryside around Sydney, they encountered a range of vegetation associations, some of which were very different to those which we see in the National Parks around Sydney today. On soils derived from Hawkesbury sandstone, Wianamatta shale, Tertiary alluvial deposits, and igneous intrusions, they found environments which reminded them of the manicured parks of England, with trees well spaced and a grassy understorey. Peter Cunningham (1827) described the country west of Parramatta and Liverpool as: 'A fine timbered country, perfectly clear of bush, through which you might, generally speaking, drive a gig in all directions, without any impediment in the shape of rocks, scrubs, or close forest'.

This confirmed earlier accounts by Governor Phillip (1791), who suggested that the trees were 'growing at a distance of some twenty to forty feet from each other, and in general entirely free from brushwood ...'.

It is clear that it was primarily Aboriginal burning practices which maintained an open environment dominated by well spaced trees and a grassy understorey. However, not all areas were burned. There are descriptions of rainforest pockets and wet-sclerophyll associations which were not burned. The margins of the creeks and rivers were mostly left intact, as evidenced by the descriptions of Watkin Tench when his party first travelled along the banks of the Nepean and Hawkesbury Rivers (Tench 1791).

The fact that many of the yam beds along the Hawkesbury provided a regular food resource suggests that some care may have been taken to ensure that the resource was renewable. Fire-breaks may have been created so that these areas did not burn. As Hallam suggests, 'Gathering yams (*Dioscorea*) was anything but a random process ... it was certainly not a matter of digging out a root here and there, but of returning regularly to extensively used tracts' (Hallam 1979: 12).

While Aboriginal people used fire as a tool for increasing the productivity of their environment, Europeans saw fire as a threat. Without regular low intensity burning, leaf litter accumulates, and crown fires can result, destroying everything in their path. European settlers feared fire, for it could destroy their houses, their crops, and it could destroy them. Yet the physical environment which was so attractive to them as farmers and graziers was created by fire. Indeed, it has been suggested that the European settlement of Tasmania followed almost exactly those areas which the Tasmanian Aborigines had regularly burned (Pyne 1991).

Consequences of the cessation of Aboriginal burning

As European settlement spread out from Sydney, traditional Aboriginal burning practices ceased. Once this happened, vegetation associations changed, animals which were once common rapidly declined, and in some cases disappeared altogether. Once the Aborigines stopped burning, the underbrush returned where none had previously existed. Benson and Howell (1990) suggest that the growth of *Bursaria spinosa* in the Sydney area in the 1820s was probably related to a changed fire regime with the cessation of Aboriginal burning.

Europeans land use practices were destructive, and totally different from Aboriginal methods. The first white settlers dug up the ground along the banks of the Hawkesbury River to plant their crops, and in the process destroyed the yam beds which the Darug people depended on (the word Darug means yam). Over 40,000 years of practicing a balanced control over the environment was destroyed in the short space of a few years.

In the more remote areas, this process took longer. In western New South Wales it happened in the 1840s and 1850s. In parts of Central Australia, the extinctions and declines still continue, although other factors are now involved. However, it can be argued that many of these changes are the result of changed fire regimes. Certainly some of the extinctions of the smaller terrestrial mammals in arid Australia occurred long before the introduction of competitors such as the rabbit and predators like the fox and cat.

SHOULD TRADITIONAL ABORIGINAL BURNING REGIMES BE RE-INTRODUCED IN SOUTHEASTERN AUSTRALIA?

Should traditional burning regimes be re-introduced into southeastern Australia? Should Aboriginal people be asked to contribute their knowledge to current land management practices? The answer must clearly be no. Aboriginal burning was used when Aboriginal people were managing the land in a particular way. It was used to maximise the productivity of the landscape. Some areas were not burnt at all, while others were burnt at frequencies varying between twice a year and once every five to ten years. Such fires would have varying degrees of impact. Certainly, those regularly burnt areas would be more open — more grass and well-spaced trees, but not all areas would look like that. Some parts of southeastern Australia were rarely if ever burned. The rugged southwest of Tasmania is unlikely to burn, because of its high rainfall. Parts of the Blue Mountains were probably not burned because of the low value in burning those areas which have steep slopes and rough topography — the very inaccessible areas which may require hazard-reduction burning if conservation or prevention of property loss are of prime concern. Relatively flat areas like the Cumberland Plain and the valley floors are much more likely to have been burnt regularly, and these are areas which are unlikely to require hazard-reduction burning.

The consequences of the re-introduction of a traditional Aboriginal burning regime, even if it could be determined what that regime actually was, would not produce the same results now as it did two hundred years ago. European activities such as farming, logging, and the introduction of feral animals have all contributed to dramatic declines and extinctions of many mammal species. Many of the species which appear to be fire specialists, such as the bettongs, have become extinct over most of their previous range (Christensen 1980; Taylor 1993). Indeed an increase in fire frequency may adversely impact on some threatened species because of the increased risk of predation by foxes and feral cats.

For most of southeastern Australia, the re-introduction of traditional Aboriginal burning is not a satisfactory alternative to sound management policies based on systematic scientific study. However, with the potential of the Native Title legislation for Aboriginal people regain control of some of their land in southeastern Australia, it may well be that regular burning is entirely appropriate as a land management tool within their own land and for their own culturally-based reasons.

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